## المعادلات الواردة بالباب الاول

(1) 
$$N_{2(g)} + 3H_{2(g)} = \frac{500^{\circ}C/200 \text{ atm}}{Fe} = 2NH_{3(g)}$$

(2) 
$$2SO_{2(g)} + O_{2(g)} - \frac{V_iO_i}{450^{\circ}C} - 2SO_{3(g)}$$

(3) 
$$SO_{3(s)} + H_2O_{(f)} - H_2SO_{4(sq)}$$

(4) 
$$2H_2O_{2(f)} \xrightarrow{MnO_2} 2H_2O_{(f)} + O_{2(g)}$$

(5) 
$$FeCO_{3(s)} \xrightarrow{\Delta} FeO_{(s)} + CO_{2(g)}$$

(6) 
$$2\text{FeO}_{(s)} + \frac{1}{2} O_{2(g)} \xrightarrow{\Delta} \text{Fe}_2 O_{3(s)}$$

(7) 
$$2\text{Fe}_2\text{O}_3.3\text{H}_2\text{O}_{(s)} \xrightarrow{\Delta} 2\text{Fe}_2\text{O}_{3(s)} + 3\text{H}_2\text{O}_{(v)}$$

(8) 
$$S_{(s)} + O_{2(g)} \xrightarrow{\Delta} SO_{2(g)}$$

(9) 
$$4P_{(s)} + 5O_{2(g)} \xrightarrow{\Delta} 2P_2O_{5(g)}$$

(10) 
$$C_{(g)} + O_{2(g)} \xrightarrow{\Delta} CO_{2(g)}$$

(11) 
$$CO_{2(g)} + C_{(g)} \xrightarrow{\Delta} 2CO_{(g)}$$

(12) 
$$3CO_{(g)} + Fe_2O_{3(s)} \xrightarrow{\Delta} 2Fe_{(s)} + 3CO_{2(g)}$$

(13) 
$$2CH_{4(g)} + CO_{2(g)} + H_2O_{(v)} \xrightarrow{\Delta} 3CO_{(g)} + 5H_{2(g)}$$

(14) 
$$2\text{Fe}_2\text{O}_{3(s)} + 3\text{CO}_{(g)} + 3\text{H}_{2(g)} \xrightarrow{\Delta} 4\text{Fe}_{(s)} + 3\text{CO}_{2(g)} + 3\text{H}_2\text{O}_{(v)}$$

(15) 
$$3Fe_{(s)} + 2O_2 \xrightarrow{\Delta} Fe_3O_{4(s)}$$

(16) 
$$3\text{Fe}_{(s)} + 4\text{H}_2\text{O}_{(v)} \xrightarrow{500^{\circ}\text{C}} \text{Fe}_3\text{O}_{4(s)} + 4\text{H}_{2(g)}$$

(17) 
$$2Fe_{(s)} + 3Cl_{2(g)} \xrightarrow{\Delta} 2FeCl_{3(s)}$$

(18) 
$$Fe_{(s)} + S_{(s)} \xrightarrow{\Delta} FeS_{(s)}$$

(19) 
$$Fe_{(s)} + H_2SO_{4(aq)} \xrightarrow{dil} FeSO_{4(aq)} + H_{2(g)}$$

(20) 
$$Fe_{(s)} + 2HCl_{(aq)} \xrightarrow{dil} FeCl_{2(aq)} + H_{2(g)}$$

(21) 
$$3Fe_{(s)} + 8H_2SO_{4(f)} \xrightarrow{\Delta} FeSO_{4(aq)} + Fe_2(SO_4)_{3(aq)} + 4SO_{2(g)} + 8H_2O_{(v)}$$

(22) 
$$(COO)_2 Fe_{(g)} \xrightarrow{\Delta} FeO_{(g)} + CO_{2(g)} + CO_{(g)}$$

(23) 
$$\operatorname{Fe_2O_{3(s)}} + \operatorname{H_{2(g)}} \xrightarrow{400^s : 700^s C} 2\operatorname{FeO_{(s)}} + \operatorname{H_2O_{(v)}}$$

(24) 
$$\operatorname{Fe_3O_{4(s)}} + \operatorname{H_{2(g)}} \xrightarrow{400^{\circ}:700^{\circ}C} 3\operatorname{FeO_{(s)}} + \operatorname{H_2O_{(v)}}$$

(25) 
$$4\text{FeO}_{(s)} + O_{2(g)} \xrightarrow{\Delta} 2\text{Fe}_2O_{3(s)}$$

(26) 
$$\text{FeO}_{(i)} + \text{H}_2\text{SO}_{4(aq)} \xrightarrow{dil} \text{FeSO}_{4(aq)} + \text{H}_2\text{O}_{(l)}$$

(27) 
$$\operatorname{FeCl}_{3(aq)} + 3NH_4OH_{(aq)} \longrightarrow \operatorname{Fe}(OH)_{3(s)} + 3NH_4Cl_{(aq)}$$

(28) 
$$2\text{Fe(OH)}_{3(s)} \xrightarrow{>200^{\circ}\text{C}} \text{Fe}_2\text{O}_{3(s)} + 3\text{H}_2\text{O}_{(v)}$$

(29) 
$$2\text{FeSO}_{4(s)} \xrightarrow{\Delta} \text{Fe}_2\text{O}_{3(s)} + \text{SO}_{2(g)} + \text{SO}_{3(g)}$$

(30) 
$$Fe_2O_{3(s)} + 3H_2SO_{4(aq)} \xrightarrow{\Delta} Fe_2(SO_4)_{3(aq)} + 3H_2O_{(v)}$$

(31) 
$$3\text{Fe}_2\text{O}_{3(s)} + \text{CO}_{(g)} \xrightarrow{230^s : 300^s\text{C}} + 2\text{Fe}_3\text{O}_{4(s)} + \text{CO}_{2(g)}$$

(32) 
$$Fe_3O_{4(s)} + 4H_2SO_{4(l)} \xrightarrow{\Delta} FeSO_{4(aq)} + Fe_2(SO_4)_{3(aq)} + 4H_2O_{(v)}$$

(33) 
$$2\text{Fe}_3\text{O}_{4(s)} + \frac{1}{2}\text{O}_{2(g)} \xrightarrow{\Delta} 3\text{Fe}_2\text{O}_{3(s)}$$

(34) 
$$FeSO_{4(aq)} + 2NaOH_{(aq)} \longrightarrow Na_2SO_{4(aq)} + Fe(OH)_{2(s)}$$

(35) 
$$FeO_{(s)} + H_{2(g)} \xrightarrow{\Delta} Fe_{(s)} + H_2O_{(v)}$$

(36) 
$$\text{FeO}_{(a)} + 2\text{HCi}_{(aq)} \xrightarrow{dil} \text{FeCl}_{2(aq)} + \text{H}_2\text{O}_{(l)}$$

## المعادلات الواردة بالباب الثاني

(1) 
$$Na_2CO_{3(s)} + 2HCI_{(aq)} - 2NaCI_{(aq)} + H_2O_{(f)} + CO_{2(g)}$$

(2) 
$$CO_{2(g)} + Ca(OH)_{2(aq)} - \frac{8.T}{} - CaCO_{3(s)} + H_2O_{(t)}$$

(3) 
$$Na_2CO_{3(aq)} + MgSO_{4(aq)} - Na_2SO_{4(aq)} + MgCO_{3(a)}$$

(4) 
$$MgCO_{3(s)} + 2HCl_{(aq)} \longrightarrow MgCl_{2(aq)} + H_2O_{(l)} + CO_{2(g)}$$

(7) 
$$Mg(HCO_3)_{2(aq)} \xrightarrow{\Delta} MgCO_{3(s)} + H_2O_{(f)} + CO_{2(g)}$$

(8) 
$$Na_2SO_{3(s)} + 2HCl_{(aq)} - 2NaCl_{(aq)} + H_2O_{(f)} + SO_{2(g)}$$

(9) 
$$K_2Cr_2O_{7(aq)} + 3SO_{2(g)} + H_2SO_{4(aq)} \longrightarrow K_2SO_{4(aq)} + Cr_2(SO_4)_{3(aq)} + H_2O_{(f)}$$

(10) 
$$Na_2SO_{3(aq)} + 2AgNO_{3(aq)} \longrightarrow Ag_2SO_{3(a)} + 2NaNO_{3(aq)}$$

(11) 
$$Na_2S_{(s)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + H_2S_{(g)}$$

(12) 
$$(CH_3COO)_2Pb_{(aq)} + H_2S_{(g)} \longrightarrow 2CH_3COOH_{(aq)} + PbS_{(s)}$$

(13) 
$$Na_2S_{(aq)} + 2AgNO_{3(aq)} \longrightarrow 2NaNO_{3(aq)} + Ag_2S_{(s)}$$

(14) 
$$Na_2S_2O_{3(s)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + H_2O_{(l)} + SO_{2(g)} + S_{(s)}$$

(15) 
$$2Na_2S_2O_{3(aq)} + I_{2(aq)} \longrightarrow Na_2S_4O_{6(aq)} + 2NaI_{(aq)}$$

$$(33) \ FeSO_{4(aq)} + NO_{(g)} \longrightarrow FeSO_4 \cdot NO_{(s)}$$

$$(34) \ 2Na_3PO_{4(aq)} + 3BaCl_{2(aq)} \longrightarrow Ba_3(PO_4)_{2(s)} + 6NaCl_{(aq)}$$

$$(35) \ Na_3PO_{4(aq)} + 3AgNO_{3(aq)} \longrightarrow 3NaNO_{3(aq)} + Ag_3PO_{4(s)}$$

$$(36) \ Na_2SO_{4(aq)} + BaCl_{2(aq)} \longrightarrow 2NaCl_{(aq)} + BaSO_{4(s)}$$

$$(37) \ Na_2SO_{4(aq)} + (CH_3COO)_2Pb_{(aq)} \longrightarrow + 2CH_3COONa_{(aq)} + PbSO_{4(s)}$$

$$(38) \ CuSO_{4(aq)} + H_2S_{(g)} \longrightarrow + H_2SO_{4(aq)} + CuS_{(s)}$$

$$(39) \ Al_2(SO_4)_{3(aq)} + 6NH_4OH_{(aq)} \longrightarrow 3(NH_4)_2SO_{4(aq)} + 2Al(OH)_{3(s)}$$

$$(40) \ Al_2(SO_4)_{3(aq)} + 6NaOH_{(aq)} \longrightarrow + NaAlO_{2(aq)} + 2H_2O_{(f)}$$

$$(41) \ Al(OH)_{3(s)} + NaOH_{(aq)} \longrightarrow + (NH_4)_2SO_{4(aq)} + Fe(OH)_{2(s)}$$

$$(43) \ FeSO_{4(aq)} + 2NH_4OH_{(aq)} \longrightarrow + Na_2SO_{4(aq)} + Fe(OH)_{2(s)}$$

$$(44) \ FeCl_{3(aq)} + 3NH_4OH_{(aq)} \longrightarrow + 3NH_4Cl_{(aq)} + Fe(OH)_{3(s)}$$

$$(45) \ FeCl_{3(aq)} + 3NaOH_{(aq)} \longrightarrow + 3NaCl_{(aq)} + Fe(OH)_{3(s)}$$

$$(46) \ CaCl_{2(aq)} + (NH_4)_2CO_{3(aq)} \longrightarrow + 2NH_4Cl_{(aq)} + CaCO_{3(s)}$$

$$(47) \ CaCO_{3(s)} + H_2O_{(f)} + CO_{2(g)} \longrightarrow + Ca(HCO_3)_{2(aq)}$$

$$(48) \ CaCl_{2(aq)} + H_2SO_{4(aq)} \longrightarrow + 2HCl_{(aq)} + CaSO_{4(s)}$$

$$(49) \ NaOH_{(aq)} + HCl_{(aq)} \longrightarrow + NaCl_{(aq)} + B_2O_{(f)}$$

## المعادلات الواردة بالباب الخامس

(2) 
$$NH_4CNO_{(aq)} \xrightarrow{\Delta} H_2N - CO - NH_{2(s)}$$

(3) 
$$C + 2CuO_{(n)} \xrightarrow{\Delta} 2Cu_{(s)} + CO_{2(g)}$$

(4) 
$$2H + CuO_{(s)} \xrightarrow{\Delta} Cu_{(s)} + H_2O_{(v)}$$

(5) 
$$CH_3COONa_{(s)} + NaOH_{(s)} \xrightarrow{CaO} CH_{4(g)} + Na_2CO_{3(s)}$$

(6) 
$$CH_{4(g)} + 2O_{2(g)} \xrightarrow{\Delta} CO_{2(g)} + 2H_2O_{(v)} + Energy$$

(11) 
$$C_8H_{18(f)} = \frac{\Delta/P}{cat} + C_4H_{8(g)} + C_4H_{10(g)}$$

(12) 
$$CH_{4(g)} = \frac{1000^{\circ}C}{\text{no air}} + 2H_{2(g)} + C_{(s)}$$

(13) CH<sub>4(g)</sub> + H<sub>2</sub>O<sub>(v)</sub> 
$$\frac{725^{\circ}\text{C}}{\text{cat}}$$
 + CO<sub>(g)</sub> + 3H<sub>2(g)</sub> دلماز اللازم (13)

(14) 
$$C_2H_5OH_{(f)} + H_2SO_{4(aq)} - \frac{conc}{80^{\circ}C} + C_2H_5HSO_{4(aq)} + H_2O_{(f)}$$

(15) 
$$C_2H_5.HSO_{4(aq)} \xrightarrow{180^{\circ}C} C_2H_{4(g)} + H_2SO_{4(aq)}$$

(16) 
$$C_2H_{4(g)} + 3O_{2(g)} = \Delta + 2CO_{2(g)} + 2H_2O_{(v)} + Energy$$

(17) 
$$C_2H_{4(g)} + H_{2(g)} = \frac{Pt \text{ or Ni}}{150^{\circ}\text{C} - 300^{\circ}\text{C}} = C_2H_{6(g)}$$

(18) 
$$H_2C = CH_{2(g)} + Br_{2(f)} \xrightarrow{CCl_4} Br - CH_2 - CH_2 - Br_{(f)}$$

$$(19) \ H_2C = CH_{2(g)} + HBF_{(g)} \longrightarrow CH_3 - CH_2 - BF_{(g)}$$

$$(26) \ C_2H_3HSO_{4(f)} + H_2O_{(f)} \xrightarrow{conc \ H_2SO_4} C_2H_5OH_{(nq)} + H_2SO_{4(nq)}$$

$$(21) \ C_2H_{4(g)} + H_2O_{(f)} \xrightarrow{conc \ H_2SO_4} C_2H_5OH_{(f)}$$

$$(22) \ \frac{H}{H} \ C = C \ H + H_2O + (O) \xrightarrow{alkalisse} CH_2 - OH CH_2 - OH$$

$$(23) \ aCH_2 = CH_2 \longrightarrow + CH_2 - CH_2 \cdot \frac{1}{h}$$

$$(24) \ C \equiv C_{(g)} + 2H_2O_{(f)} \longrightarrow H - C \equiv C - H_{(g)} + Ca(OH)_{2(nq)}$$

$$Ca$$

$$(25) \ 2CH_{4(g)} \xrightarrow{fast \ cooling} C_2H_{2(g)} + 3H_{2(g)}$$

$$(26) \ 2C_2H_{2(g)} + 3O_{2(g)} \longrightarrow A CO_{2(g)} + 2H_2O_{(v)} + 2C_{(s)}$$

$$(27) \ 2C_2H_{2(g)} + 5O_{2(g)} \longrightarrow A CO_{2(g)} + 2H_2O_{(v)} + 300^{\circ}C$$

$$(28) \ H - C \equiv C - H_{(g)} + H_{2(g)} \xrightarrow{Ni} H_2C \equiv CH_{2(g)} \xrightarrow{+B_f} C_2H_{6(g)}$$

$$(29) \ C_2H_{2(g)} + BF_2 \xrightarrow{CCI_4} B_FCH = CHBF_{(f)} \xrightarrow{+B_f} B_F - CH - CH - BF_{(f)}$$

$$(30) \ C_2H_{2(g)} + HBF_{(g)} \longrightarrow H_2C = CHBF_{(g)} \xrightarrow{HB_f} CH_3 - CHBF_{2(f)}$$

$$(31) \ H - C \equiv C - H_{(g)} + H_2O_{(g)} \xrightarrow{H_2SO_4(60\%)} H_1 \xrightarrow{H} OH_1 \xrightarrow{V=3J_2 \ Sale} CH_3 - CHO_{(f)}$$

$$(32) \ CH_3 - CHO_{(f)} \xrightarrow{acidihed \ KMaO_4} CH_3COOH_{(f)}$$

$$(33) \ CH_3CHO_{(f)} \xrightarrow{Treduction} CH_3CH_2OH_{(f)}$$

$$(34) \ CH_3 - (CH_2)_4 - CH_{3(f)} \xrightarrow{A} CH_{6(f)}$$

$$(48) C_{12}H_{22}O_{11(s)} + H_{2}O_{(t)} \xrightarrow{\text{hydrolysis}} C_{6}H_{12}O_{6(sq)} + C_{6}H_{12}O_{6(sq)}$$

$$(49) 2C_{6}H_{12}O_{6(sq)} \xrightarrow{\text{yeass}} + 4C_{2}H_{3}OH_{(t)} + 4CO_{2(g)} + \text{Energy}$$

$$(50) 2C_{6}H_{12}O_{6(sq)} \xrightarrow{\text{craking}} C_{2}H_{4(g)} + H_{2}O_{(t)} \xrightarrow{\text{conc } H_{2}SO_{4}} C_{2}H_{5}OH_{(v)}$$

$$(51) CH_{3} - CH = CH_{2(t)} + H_{2}O_{(t)} \xrightarrow{\text{conc } H_{2}SO_{4}} CH_{3} - CH - CH_{3(t)}$$

$$(51) CH_{3} - C = CH - CH_{3(t)} + H_{2}O_{(t)} \xrightarrow{\text{conc } H_{2}SO_{4}} CH_{3} - CH - CH_{3(t)}$$

$$(52) CH_{3} - C = CH - CH_{3(t)} + H_{2}O_{(t)} \xrightarrow{\text{conc } H_{2}SO_{4}} CH_{3} - C - CH_{2} - CH_{3(t)}$$

$$(53) C_{2}H_{5}Br_{(t)} + KOH_{(sq)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} C_{2}H_{5}OH_{(sq)} + KBr_{(sq)}$$

$$(54) (CH_{3})_{2}CHBr_{(t)} + KOH_{(sq)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} (CH_{3})_{2}CHOH_{(sq)} + KBr_{(sq)}$$

$$(55) (CH_{3})_{3}CCl_{(t)} + KOH_{(sq)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} (CH_{3})_{2}CHOH_{(sq)} + KCl_{(sq)}$$

$$(56) 2C_{2}H_{5}OH_{(t)} + 2Na_{(s)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} (CH_{3})_{3}COH_{(sq)} + NaOH_{(sq)}$$

$$(57) C_{2}H_{5}ONa_{(t)} + H_{2}O_{(t)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} C_{2}H_{5}OH_{(sq)} + NaOH_{(sq)}$$

$$(58) CH_{3}COOH_{(t)} + C_{2}H_{5}OH_{(t)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} CH_{3}COOC_{2}H_{5(sq)} + H_{2}O_{(t)}$$

$$(59) C_{2}H_{3}OH_{(t)} + HCl_{(t)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} C_{2}H_{5}Cl_{(sq)} + H_{2}O_{(t)}$$

$$(60) CH_{3}CH_{2}OH_{(t)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} CH_{3}COOC_{2}H_{5(sq)} + H_{2}O_{(t)}$$

$$(61) CH_{3} - \frac{1}{C} - CH_{3(t)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} CH_{3}COOH_{(t)} + H_{2}O_{(t)}$$

$$(61) CH_{3} - \frac{1}{C} - CH_{3(t)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} CH_{3}COOH_{(t)} + H_{2}O_{(t)}$$

$$(61) CH_{3} - \frac{1}{C} - CH_{3(t)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} CH_{3}COOH_{(t)} + H_{2}O_{(t)}$$

$$(62) C_{2}H_{5}OH_{(t)} \xrightarrow{\frac{t_{2}CL_{4}}{\Delta}} CH_{3}OCC + C_{2}H_{4(g)} + H_{2}O_{(v)}$$

$$(63) \ 2C_2H_3OH_{(f)} \xrightarrow{\text{cosc } H_2SOL_4} C_2H_3OC_2H_{5(g)} + H_2O_{(v)}$$

$$CH_2 - OH \qquad CH_2 - ONO_2 \qquad CH_2 \qquad CH_2 - ONO_2 \qquad CH_2 - ONO_2 \qquad CH_2 \qquad COOH_2 \qquad CH_2 - ONO_2 \qquad CH_2 \qquad CH_$$

(88) 
$$CH_3 - CH = CH_{2(g)} + HBr_{(g)} - CH_3 - CHBr - CH_{3(l)}$$

(89) 
$$CH_3 - CHBr - CH_3 + KOH - CH_3 - CHOH - CH_3 + KBr$$

(93) 
$$CH_3 - C(CH_3) = C(CH_3) - CH_3 + HB_1 - CH_3 - CH(CH_3) - CB_1(CH_3) - CH_3$$

(94) 
$$H_2C = C(CH_3) - CH_3 + HBr$$
  $\longrightarrow CH_3 - CBr(CH_3) - CH_3$ 

(97) 2 
$$\bigcirc$$
 + 2HNO<sub>3</sub>  $\xrightarrow{\text{cossc}}$  +  $\bigcirc$  +  $\bigcirc$  NO<sub>2</sub> +  $\bigcirc$  + 2H<sub>2</sub>O

(98) 
$$CH_3 - CH_2 - CH_2OH \frac{cone H_2SO_4}{180^{\circ}C} + CH_3 - CH = CH_2 + H_2O$$

(102) 
$$CH_3(CH_2)_2CH_2Br + KOH_{(aq)} \xrightarrow{\Delta} CH_3(CH_2)_2CH_2OH + KBr$$

(103) 
$$CH_3 - CH_2 - CHB_1 - CH_3 + KOH_{(eq)} \xrightarrow{\Delta} CH_3 - CH_2 - CHOH - CH_3 + KB_1$$

(105) 
$$CH_3(CH_2)_2CH_2OH \xrightarrow{[O]} CH_3(CH_2)_2CHO \xrightarrow{[O]} CH_3(CH_2)_2COOH$$

(106) 
$$CH_3 - CH_2 - CHOH - CH_3 - \frac{|O|}{-H_2O} - CH_3 - CH_2 - \frac{O}{C} - CH_3$$

(120) 
$$C_2H_{6(g)} + Br_{2(f)} \xrightarrow{UV} C_2H_5Br_{(g)} + HBr_{(g)}$$